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ture of the *Naiidaceæ*. He especially described the arrangement of leaves in the genus *Helophila*. In this marine tropical phnæogam, the stem is a creeping jointed rhizoma; at each joint occurs a pair of sheathing scale leaves. No foliage leaves occur on the main axis. In the axil of one scale leaf of each pair arises eccentrically a lateral secondary shoot, which is a jointed rhizoma like the parent, and the first pair of leaves upon it is a pair of foliage leaves, the succeeding leaves on this axis are all scale leaves. From these secondary axes tertiary ones arise, which again repeat the process. Thus the foliage leaves in these plants only occur as the first pair of leaves on the lateral shoots. This is probably unique in the vegetable kingdom. The homologies of the parts of the male and female flowers were also pointed out.

The *Bulletin* of the Torrey Botanical Club for October (which was late in coming) contains several notes by Messrs. Eaton, Underwood and Gilbert, on the ferns of the United States.

In the *Botanical Gazette* for November, Fendler's Ferns of Trinidad are noticed by Prof. Eaton. The leaves of *Darlingtonia californica* and their two secretions are described by Mrs. R. M. Austin.

ZOÖLOGY.¹

ON THE ORIGIN OF BILATERAL SYMMETRY AND THE NUMEROUS SEGMENTS OF THE SOFT RAYS OF FISHES.—As is well known, the soft fin-rays of *Acanthopterous* fishes and all or most of the fin-rays of *Malacopterygians*, are composed of two bilaterally symmetrical ossified and more or less completely segmented halves, semicircular in section, each having a groove on its inner face to receive between them a cartilaginous medulla. Their embryological history shows that the process of ossification is progressive from without inwards, or in the language of recent authorities it may be styled ectosteal.

Viewed in a non-teleological, or in the light of what seem to be the probable mechanical (dynamical) differentiating causes, their origin becomes extremely simple. No type of vertebrate limb has such exceedingly short and numerous segments in relation to its total length. In extreme contrast with them we may place the digital wing-elements of the *Chiroptera* and *Pterosauria*, and of these it may be said no vertebrate types exhibit such excessive elongation of the digital elements in proportion to their aggregate length. Contrasting their habitual modes of use in relation to their surroundings, we find the media, water and air, in which the two, respectively fins and wings, are used differ as widely in respect to density. That such difference in structure should accompany such widely differing conditions would seem to be caused by those conditions. Then, like those types which perambulate over approximate planes, there are no definite points of im-

¹The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COVES, U. S. A.

pact, hence we find no specialization of structure for counteracting, or rather for preventing injuries which such impacts might cause, as we find in hoofs, corneous pads or soles, nails and claws, but the whole impinging surface of the osseous supporting structure is differentiated or developed in degrees; in general terms it is most developed proximally and gradually shades off, becoming least developed distally. Again, in the fish but little osseous tissue is found developed anywhere except in opposition to the lines of greatest mechanical resistance encountered in locomotion; so that paradoxical as it may appear, it looks as though the means of locomotion have actually been cumulatively and phylogenetically developed by the means used to effect the movements. In this way we may probably explain the bilaterally symmetrical disposition of the osseous part of the soft rays which are thickest where the resistance is theoretically the greatest. On the other hand, the volant types, which are provided with interdigital alar membranes, have their bones of the ordinary type, that is, ossified alike on all sides, hence essentially tubular; in the *Pterosauria* the walls of the tubular digital bones are very thin but dense, which is in agreement with the requirements of their environments and is probably caused by them.

As a non-teleological summary the following principles are derived:

1. In proportion to the degree of resistance or density of the medium traversed, do osseous segments tend to be abbreviated and *vice versa*. (This tendency is only overcome by means of relatively great muscular specialization, as in the long-limbed Anurous Batrachians and Ungulate Mammals, but even here the remote impinging elements tend to become shorter.)

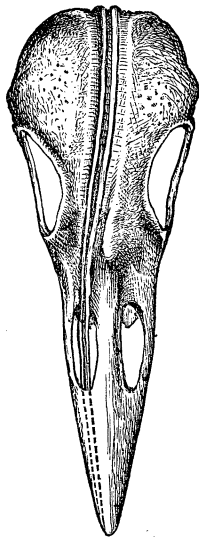
2. The tendency to the development of osseous structure in the lines of greatest resistance seems to be an invariable phenomenon attending the exhibition of vertebrate life on our planet, and in this way bilateral symmetry of the osseous halves of soft fin-rays is accounted for, and on the self-evident assumption that the rythmical efforts exerted in opposite directions in overcoming inertia are potentially alike, the morphological effects tending from this cause to be repeated on opposite sides of a part or the whole of the body as the case may be. The general truth that bone is developed ecto-chondrially is accordingly in large part explained.

The segmentation of limbs, of the notochord of arthropods, etc., into series of phalanges, vertebræ, osteomeres, neuromeres, myomeres, renomeres, antimeres, somites, etc., becomes clearly subordinate to the foregoing.

It will be apparent to those familiar with a sufficiently great number of animal types and structural features that the above, when taken together with the doctrine universal of mutual retroactivity existing between living forms and their environment, will explain away deductively the origin of a great majority of the

morphological features of those living forms. A so modified Lamarckian philosophy of animal differentiation seems reasonable, and a most overwhelming mass of evidence exists in its favor; varieties, species, genera, etc., presenting only the milestones, as it were, of the great non-teleological and universal process of evolution by means of knowable and discoverable causes originating in the mechanical and dynamical conditions which surround living organisms, and by which they are related to the cosmos. This, however, goes without saying, that types may not be more or less persistent from the persistence of a uniformity of conditions.—*John A. Ryder.*

SOME NEW POINTS IN THE CONSTRUCTION OF THE TONGUES OF WOODPECKERS.—The tongue of the woodpecker is long, flat, horny, and at its end armed with a number of short barbs. By means of a peculiar mechanism it can be suddenly pushed out, so as to reach far beyond the point of the bill. The two cartilaginous appendices to the hyoid bone, known as "the horns," are curved into wide arches, each horn making a loop down the neck, and thence bending upwards, sliding around the skull down on the forehead. Through a peculiar muscular arrangement of the sheaths, in which the horns slide, they can be retracted down on the occiput, and will then work as springs on the base of the tongue, forcing it out with great velocity. These peculiarities in the construction of the tongues of woodpeckers have long been known, and the above description is pretty nearly the same as that given by Claus in his "Grundzüge der Zoologie."



Some years ago I was engaged in Sweden, in preparing zoötomical specimens, among which were some woodpeckers' heads, viz: one *Picus tridactylus*, two *P. martius* and more than twenty *P. viridis*.

In every one of them I noticed a peculiar *asymmetric arrangement* of the horns, which, upon reaching the upper part of the skull, met in a broad groove of its surface, and following the groove, are turned towards the right side of the forehead, running down between the right orbit and the crest, which is raised along the median line of the lower part of the forehead, slightly inclined towards the right side.

In *P. tridactylus* and *P. martius* I found that the horns end above the base of the forehead. But in *P. viridis* they extend through the nasal fossa into the cavity, which is covered by the

The skull of *Gecin-
us viridis* L., showing
the asymmetrical position
of the horns
(cornua linguae) and
their extension
through the nasal fossa
to the end of the cavity
covered by the intermaxillare.

os intermaxillare, their ends reaching all the way out to the extreme end of the said cavity.

Since that time I have had no opportunity of making further investigations in this matter. It seems probable that such an arrangement as found in the tongue of *P. viridis* would enable the bird to project its tongue further and with greater velocity than those that have shorter horns. Therefore I would suppose that *P. viridis* feeds on larvæ which live in the deeper parts of the wood and are quick in their motions. This, however, I must acknowledge to be merely a supposition, but it is a point worthy of the attention of zoölogists.—*Dr. Josua Lindahl.*

AMPHIOXUS AND LINGULA AT THE MOUTH OF CHESAPEAKE BAY. —In his account of a foundation of a zoölogical laboratory at the mouth of Chesapeake bay, as a summer school of instruction for the students of John Hopkins University, Prof. W. K. Brooks, in the third Annual Report of the University, thus speaks of the scientific results of the summer's work, and of the discovery of the early stages of Amphioxus and Lingula. We shall elsewhere notice the workings of this laboratory :

"The amount of advantage which zoölogical science can derive from the discovery and description of new species is very slight as compared with that which is gained by the careful study of the whole life-history of any form of life—old or new. As this work can be done only where the living animals can be had, it is properly *laboratory* work, as distinguished from *museum* work, or the identification of species.

"I accordingly made no attempt to find and describe new forms, but devoted all our time to the careful study of a few important species ; selecting for this purpose, from among those which were abundant at our station, the ones a knowledge of which is most desirable to science. I may say, however, that two of the forms which we selected for careful study were new additions to the fauna of this region. One of these, *Amphioxus*, was studied by Mr. Rice. *Amphioxus* is a small worm-like animal, the lowest of the vertebrates, and it is of very great scientific interest, since it has preserved many evidences of a relationship to various groups of invertebrates, and thus serves to bridge over the gap which was supposed by Cuvier and Agassiz to separate the vertebrata from all lower forms of life. Its embryology, which may be termed the key to the embryology of all the higher animals, has been ably studied by several of the most distinguished zoölogists of Europe, and a number of papers have appeared upon the subject within a few years. We fortunately found several larvæ which had passed beyond the stages studied by these naturalists, but which had not yet acquired the adult characteristics. Mr. Rice succeeded in keeping these alive, and was thus able to supply the information necessary to complete our knowledge of its development. He also made very interest-

ing observations upon the habits of *Amphioxus*. *Amphioxus* has been found upon the coast of North Carolina, and last winter one of the assistants of the Smithsonian Institution discovered it in the Bermudas; until this summer these were the only instances of its occurrence upon this side of the Atlantic.

"Another important form of life which was carefully studied, is *Lingula*, one of the Brachiopods, a group which has been of great importance during past geological periods, but has now almost entirely disappeared. *Lingula* itself has persisted unchanged from the time of formation of the oldest fossiliferous rocks, and is one of the first living things of which we have any knowledge. As *Lingula* has not before been found under circumstances which admitted of careful study, almost nothing was known of its development, but I was able to trace its life-history this summer from a very early stage up to the adult form, and to show that, old as it is, each individual, from the time of the lower Silurian up to the present time, has transmitted to its children a developmental record which proves that *Lingula* itself is the descendant of a much older form."

SINGULAR HABIT OF A MELOID BEETLE.—I have noticed for the past two seasons a singular habit of one of the Meloid beetles, *Tricrania stansburii*, which, so far as I am aware, seems somewhat at variance with the known habits of this family. Previous to the spring of 1877 this beetle was very rarely taken, and is yet, I believe, not common in collections. In April of that year a few were caught on the Kansas plains, slowly flying over the uplands on warm sunny days. In the latter part of the month, however, a number of specimens were observed in the bottom of a wagon bed that had been used to collect buffalo bones for the market; upon further investigation large quantities were obtained from the decaying buffalo and antelope bones on the high prairies. They chose only the cancellous tissue of the limb bones, or more especially the ethomidal and sphenoidal regions of the skull in weathered skeletons. None were ever taken after the latter part of May. In early May of the present year several were taken from a decayed railroad tie in the vicinity of Como, Wyoming; one female having apparently just deposited a mass of eggs in a warm fissure.

The large number upon the plains, both of species and individuals, in this genus, together with *Meloe*, *Nomaspis*, *Macrobasis*, *Epicauta*, *Pyrota*, *Zonitis*, *Nemognatha* and *Gnathium*, and the parasitism of several of these, as shown by Prof. Riley, upon the locusts, will render a further elucidation of the habits of *Tricrania* an interesting one.—S. W. Williston.

NEW CARCINOLOGICAL PAPERS.—Mr. E. J. Miers, of the British Museum, publishes a "Revision of the Hippidea" in the Journal of the Linnæan Society, Vol. xiv, in which he enumerate six

genera and twenty-two species from the whole world. This author rejects Dana's view of placing these Crustacea immediately beneath the Corystoidea, but would rather follow Lamarck and Milne Edwards and connect them with the Oxystomatous Crustacea through the family Raninidæ.

These Crustacea are represented on our coast (south of Cape Cod by *Hippa talpoida* Say, which our author is inclined to consider the same as *Hippa emeritus* of Fabricius (*Cancer emeritus* L.).

A second paper by the same author on a collection of Crustacea from the Gulf of Akabo, at the northern extremity of the Red Sea (Annals and Mag. Nat. Hist., Nov., 1878), has some interesting remarks upon some species of the difficult genus Trapezia. —*J. S. Kingsley, Providence, R. I.*

MODE OF DRINKING OF THE RED SQUIRREL.—In a late camping excursion in the wilderness of Wisconsin, on the Upper Manominee, we frequently met the common red or Hudson's bay squirrel (*Sciurus hudsonius*) swimming the river, when they were easily taken into the canoes. Several of the ladies of the party interested themselves by confining the squirrels in boxes, and then feeding and watering them; in most cases they gnawed their way out and were gone the next morning, but not all. They were observing girls, and a discussion soon arose among them, whether the squirrels drank water by the sucking or by the lapping process, which was finally referred to me for decision. Miss H. had one which had already become quite domesticated, and would come at her call to eat and drink, which was done through a small orifice not large enough to admit the passage of the whole head. A little triangular cup was formed of a leaf and filled with water, and one angle presented to the opening and the squirrel called. He instantly came, projected his nose out about half an inch to the water and commenced drinking. This, beyond all doubt, was done by lapping up the water, as is the habit of the dog and the cat, but the process was so exceedingly rapid as to require a very careful scrutiny to detect it with certainty. The position was very favorable for accurate observation, and the point was finally yielded by the doubters.

This may be familiar to naturalists, but I do not remember to have observed any examination as to the modes in which the various quadrupeds drink, nor had the subject previously occupied my attention. Do all the rodents lap their drink like the dog and the cat families? Has any naturalist undertaken to settle the question as to what quadrupeds drink by lapping and what by sucking the water? It seems to me that these are characteristics of scientific importance, and worthy of attention.—*J. D. Caton, Ottawa, Ills.*

CAND. ROBT. COLLETT, of the University of Christiania, has lately published a list of Norwegian Zoölogical literature for 1877, of which the following is a summary :

R. Collett, "On *Myodes lemmus* in Norway." Some remarks on the migratory habits of the Norwegian lemmings (Journ. Lin. Soc. Zoöl. Vol. xiii., pp. 327-334). *Id.*, three papers containing contributions to the Ornithology of Norway (Proc. Zoöl. Soc., Lond., 1877, pp. 43-46; Nyt Mag. f. Naturv. Vol. xxiii, No. 4, pp. 85-225; and Forh. Vid. Selsk. Christiania, 1877, No. 5; pp. 4). *Id.*, a synopsis of fifty-nine species of birds from Madagascar and Bourbon, presented to the Christiania Museum (Forh. Vid. Selsk. Christiania, 1877, No. 6; pp. 20).

J. Koren and D. Danielsen, descriptions of six new species of the gastropod tribe *Solenopus* M. Sars (Arch. f. Math. Naturv., Vol. ii, No. 2, pp. 120-128).

H. Friele, "Preliminary report on Mollusca from the Norwegian North Atlantic Expedition in 1876," with one autograph plate (Nyt Mag. f. Naturv., Vol. xxiii, No. 3, pp. 1-10). *Id.*, a paper on the radula of Norwegian *Rhipiaglossa*, with four autograph plates (Arch. f. Math. and Naturv., Vol. ii, No. 2; pp. 217). *Id.*, "The development of the skeleton in the genus *Waldheimia*," with six lithograph plates (Arch. f. Math. and Naturv., Vol. ii, No. 4, pp. 380-386).

J. Sparre Schneider, a report on the Lepidoptera collected by the author near Drammen in 1876 (Forh. Vid. Selsk. Christiania, 1877, No. 4; pp. 30).

H. Siebke, "*Enumeratio Insectorum Norvegicorum. Fasc. iv, catalogum Dipterorum continens.*" Ed. J. Sp. Schneider. 255 pages (University programme, 1877).

V. Storm, a report on the Museum of "Videnskabernes Selskab," and some notices of rare Coleoptera, found around Drontheim (Det Kgl. N. Vid. Selsk. Skr. i 19 Aarh., Vol. viii, No. 4; pages 131-162).

G. O. Sars, on the *Mysidæ* of the Mediterranean, with thirty-six autograph plates (Arch. f. Math. and Naturv., Vol. ii, No. 1, pp. 10-119). *Id.*, *Prodromus descriptionis crustaceorum Pycnogonidarum, quæ in expeditione Norvegica, anno 1876, observavit* (Arch. f. Math. and Naturv., Vol. ii, No. 3; pp. 237-269).

D. Danielson and J. Koren, a synopsis of the *Echinodermata*, collected in the Norwegian expedition to the North Atlantic, in 1876. Several new species, among them one crinoid, *Ilycrinus carpenterii*, from a depth of nearly 1500 fathoms in a temperature of -1.6° C.; three lithograph plates (Nyt Mag. f. Naturv., Vol. xxiii, No. 3; pp. 45-83).

J. Koren and D. Danielsen, "Fauna littoralis Norvegiæ," Part III, with sixteen plates, pp. 163, folio. Bergen, 1877. This volume forms the third part of the important work, of which the first part was published in 1846, by the late Prof. M. Sars, and the second in 1856, by M. Sars, J. Koren and D. Danielsen. The third part contains seven separate papers, viz.: 1. New or little known *Cœlenterata*, by M. Sars; ed. G. O. Sars. 2. New *Echinodermata*,

by M. Sars; ed. G. O. Sars. 3. New Norwegian *Cœlenterata*, by Koren and Danielsen. 4. Norwegian *Pennatulidæ*, by Koren and Danielson. 5. New *Bryozoa*, by Koren and Danielson. 6. Norwegian *Gephyrea*, by Koren and Danielson. 7. A new species of the genus *Pennella*, by Koren and Danielson.—(F. L).

ANTHROPOLOGY.¹

ANTHROPOLOGICAL NEWS.—Dr. George A. Otis, the curator of the U. S. Army Medical Museum, writes the following with reference to the work done at the museum under his charge: "Since January 1, 1878, Section IV, of the Army Medical Museum, has received specimens numbered from 1830 to 1952, inclusive, and comprising skeletons, crania and calvaria of American origin, with the exception of fifteen New Zealand calvaria transmitted from the Smithsonian Institution. These specimens have been carefully prepared, numbered and mounted; the principal measurements, in each case, made and recorded. Among the additions to the complete skeletons of American Indians was a series of seven Sioux, exhumed by Assistant Surgeon Corbusier; specimens from the shell-heaps of Florida, from Colorado and from Tennessee, of supposed pre-historic date, are of especial interest." The immense amount of work required by the Medical History of the War has exhausted all the funds appropriated for this institution. But Dr. Otis, with his trained assistants, has measured and mounted every important cranium which he has received, and has reconstructed from fragments many pre-historic skulls, an art in which he is exceedingly skillful. As soon as time and funds will allow, the results of these measurements will be laid before the scientific world.

The Rev. S. D. Peet, editor of the *American Antiquarian*, sends us his Prospectus, and it gives us great pleasure not only to draw attention to it, but to urge upon all lovers of American archæology to make sacrifices to sustain it. Mr. Peet, without State or Government patronage, has for years given his leisure freely to aboriginal history. It is due to him as well as to the subject which we love in common, that he be not left alone in the matter. The brilliant success achieved in anthropology in England and Germany, but most of all in France, is due mainly to the interest awakened by the periodicals devoted solely to this one subject. The advantage of a special organ ever disseminating our efforts throughout all the periodicals of the country is apparent to all. Mr. Peet's address is at present Unionville, O.

The New York *Herald*, of November 5th, contains a review of Col. Mallery's paper on the supposed decrease in the number of our aborigines. Having once drawn attention to this paper, our space and our duty to the truth will not allow us to refer to it again, lest mistaken zeal rob the truth of its reward. Col. Mal-

¹Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.